Scaling up low-cost moisture meters to improve income, food safety and health.

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Variety of “local” methods used to test moisture (western Kenya)

People recognize that traditional methods are error prone!
Motivation

- Moisture meters, used in developed world are expensive (> US $150)
  - Unattainable and unavailable for most smallholders and small-scale traders.

- Economic issues:
  - Moisture not fully observable without meter
  - Kenyan cereal board (NCPB) purchases only if moisture content is below 13%
Our technology: Hygrometer

- Hygrometer
- Standard household device calibrated at Purdue University’s Food Processing and Post-Harvest Handling (FPL) Innovation Lab
- Provides a numeric reading
- Imported from China
- Est. Wholesale price = US $0.90

Estimated Price
USD 0.90
Demonstration

• Demonstrated hygrometer working and another technology the DryCard™

• Four bags of maize were carried by enumerator
  • 2 bags with dry and 2 bags of wet maize

• Hygrometer and DryCard™ were each put in a dry and wet bag of maize respectively
Becker De Groot Maschak (BDM) Auction

Benefit
• **Involves actual purchase**
• Possible on a one to one basis
• Price actually paid is random

Process
• Participant bid is compared to random price
• If random price is higher then no transaction
Demand Curves

- Involves plotting out percent of population purchasing on y axis and the price on the x axis.
- The dotted lines display mean willingness to pay for farmers (1.30 USD) and traders (1.20 USD).

N = 589 These estimates represent the proportion of respondents willing to pay at or above a given price.
Profit for wholesalers

- Assuming constant cost $0.9/hygrometer Estimate Profit by multiplying the proportion of population likely to buy at each price with the margin at each price

- Profit for Hygrometer can be maximized by selling at $1.90 to 25% of the population

Profit from estimated sales

Hygrometer price point (USD)

N = 589. These estimates are calculated as the sales - cost of goods sold per hygrometer times the proportion that is likely to buy at that price point
How does the hygrometer compare?

Cost

Effectiveness = Precision + Time
How does the hygrometer compare?

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>DryCard™</td>
<td>Cheapest but not precise</td>
</tr>
<tr>
<td>Grain Mate</td>
<td>More expensive, but direct moisture content reading and faster</td>
</tr>
<tr>
<td>John Deere Moisture tester</td>
<td>Most expensive</td>
</tr>
<tr>
<td>Hygrometer</td>
<td>Still relatively cheap, but significant precision gain (numeric reading so more objective)</td>
</tr>
</tbody>
</table>

Effectiveness = Precision + Time
If both devices were available to you at the price you bid which one would you prefer?

Hygrometer preferred by 74% of the sample

26%
Reason for preference of Hygrometer

- Cheaper, 1.6
- More Durable, 20
- Has batteries, 1.4
- Exact Number/Greater Accuracy, 77
Future Steps

• Household device-Available for purchase from multiple manufacturers
  • If a bulk purchase is made directly from the manufacturer, the per-unit price of the hygrometer can be lowered below $0.90.

• Plan to use the input supply chain for the Purdue Improved Crop Storage Bags in Kenya (Bell Industries)

• Bell Industries will look into getting permission to classify each commodity as an agricultural input in order to gain import tax exemption.

• Train extension workers from KALRO on the usage of the product in the areas where we are piloting the product.

• Need follow-up research on how well the hygrometer and DryCard™ have done in the field